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Naval Proving Ground ltr dtd 30 Dec 1953

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

REPORT NO. 355

MINE AND MINE COMPONENT TESTING
UNDER
TASK ASSIGNMENT NPG-33-Re6b-311-1

7th Partial Report

- -

AIRCRAFT DROPS OF REEFED PARACHUTES, 4K. 2 MOD. 3, ASSEMBLED ON MINES, MK. 36, TO DETERMINE TERMINAL VELOCITY AND FLIGHT CHARACTERISTICS

FINAL Report

Copy No. _____

Task Assignment NPG-33-Re6b-311-1

Classification RESTRICTED

NPG REPORT NO. 355

RESTRICTED

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

Seventh Partial Report

on

Mine and Mine Component Testing

under

Task Assignment NPG-33-Re6b-311-1

- - - - - - - - - - - - - - - - - - - -

Final Report

on

Aircraft Drops of Reefed Parachutes,
Mk. 2 Mod. 3, Assembled on Mines, Mk. 36,
To Determine Terminal Velocity and Flight Characteristics

Project No.: NPG-33-Re6b-311-1
No. of Pages: 7

Date: 23 AUG 1949

RESTRICTED

Aircraft Drops of Reefed Parachutes, Mk. 2 Mod. 3, Assembled on Mines, Mk. 36, To Determine Terminal Velocity and Flight Characteristics

PART A

SYNOPSIS

1. This is a report on aircraft drops of Mines, Mk. 36, assembled with Reefed Parachutes, Mk. 2 Mod. 3, conducted under Task Assignment No. NPG-33-Re6b-311-1.

2. This test was conducted to determine the flight characteristics and terminal velocities of Mines, Mk. 36, assembled with Parachutes, Mk. 2 Mod. 3, which contained reef lines to control the diameter of the mouth of each parachute.

3. It is concluded that:

a. The flight characteristics of each mine were satisfactory.

b. The terminal velocity for each mine drop was as follows:

Drop No.	Diameter of Mouth of Chute (Feet)	Terminal Velocity (Feet Per Second)
1	6 (Not Reefed)	164
2	5	173
3	4	202
4	3-1/2	211
5	3	218
6	2-1/2	241
7	2	256
8	1-1/2	298

The estimated probable errors of the terminal velocities are plus or minus five feet per second.

Aircraft Drops of Reefed Parachutes, Mk. 2 Mod. 3, Assembled on Mines, Mk. 36, To Determine Terminal Velocity and Flight Characteristics

TABLE OF CONTENTS

Aircraft Drops of Reefed Parachutes,
Mk. 2 Mod. 3, Assembled on Mines, Mk. 36,
To Determine Terminal Velocity and Flight Characteristics

PART B

INTRODUCTION

1. AUTHORITY:

This test was directed by reference (a) under Task Assignment No. NPG-34-Re6b-311-1 authorized by reference (c). Reference (a) requested that the test be conducted in accordance with the outline in reference (b).

2. REFERENCES:

a. NOL restr. speedltr NP51/F43-1(1-259) dated 11 April 1949.
b. NOL TSS No. 5528.
c. BuOrd Conf. ltr. NP9(Re6b) dated 3 September 1948.
d. NPG restr. report No. 337 dated 1 August 1949.

3. BACKGROUND:

This test is part of a program to design a parachute capable of withstanding opening shock at high launching speeds.

4. OBJECT OF TEST:

This test was conducted to determine the terminal velocity and flight characteristics of Reefed Parachutes, Mk. 2 Mod. 3, assembled on Mines, Mk. 36.

5. PERIOD OF TEST:

a. Date of Project Letter	11 April 1949
b. Date Necessary Material Received	27 April 1949
c. Date Commenced Test	28 April 1949
d. Test Completed	29 April 1949

6. REPRESENTATIVES PRESENT:

G. L. Fogal	Naval	Ordnance	Laboratory
L. C. Ripley	"	"	"
J. I. Kistle	"	"	"

Aircraft Drops of Reefed Parachutes,
Mk. 2 Mod. 3, Assembled on Mines, Mk. 36,
To Determine Terminal Velocity and Flight Characteristics

PART C

DETAILS OF TEST

7. DESCRIPTION OF ITEM UNDER TEST:

a. Seven standard Parachutes, Mk. 2 Mod. 3, which have a diameter of 6 feet, were modified by choking the diameters at the hemline to 5 feet, 4 feet, 3-1/2 feet, 3 feet, 2-1/2 feet, 2 feet and 1-1/2 feet, respectively. One standard Parachute, Mk. 2 Mod. 3, was not modified by reefing. Figure 1 shows the method of reefing. In this particular case the diameter is three feet.

b. The parachutes were housed in Parachute Pack, Mk. 9 Mod. 0, modified as described in reference (d). This is shown in Figure 2.

c. Parachute packs were assembled on plaster loaded Mine Cases, Mk. 36, by means of attaching bands constructed according to NOL Sketch 95315.

8. DESCRIPTION OF TEST EQUIPMENT:

a. The following types of aircraft were used in this test:

(1) Mines were launched from a TBM-3E.
(2) Aerial photographs were taken with a hand-held Cine-Flex camera from an SNJ-4.

b. Ground instrumentation consisted of three Mitchell high speed cameras. Two Mitchell cameras with 4 inch lenses were focused on the target to record data necessary to compute terminal velocities. One Mitchell camera with 17 inch lens was used to photograph release, trajectory, and impact of each mine. This film and the film from the Cine-Flex camera is included as Appendix (B).

Aircraft Drops of Reefed Parachutes,
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To Determine Terminal Velocity and Flight Characteristics

9. PROCEDURE:

a. Eight Mines, Mk. 36, with the test parachutes attached were launched separately from a TBM-3E type aircraft using horizontal bombing technique from true altitudes of 5000 feet and at airspeeds of 120 knots, indicated.

b. Aerial photographs were taken from an SNJ-4 type aircraft which flew approximately 200 feet below and 400 feet to one side of the launching aircraft. Upon release of the mine, the photographic plane descended in a sharp bank to photograph the entire flight of the mine. Film from the stationary Mitchell cameras was evaluated for terminal velocity data. The film from the Mitchell with 17 inch lens and the Cine-Flex camera was used to determine flight characteristics of each drop.

10. RESULTS AND DISCUSSION:

a. The operation of the parachutes and packs was satisfactory for all drops. The reef lines held the parachutes in a balloon shape which filled properly and remained inflated throughout flight. The flight of each mine was relatively smooth with no excessive yawing or oscillation.

b. The terminal velocities of the reefed parachutes assembled on Mines, Mk. 36, were determined to be as follows:

Drop No.	Diameter of Mouth of Chute (Feet)	Terminal Velocity (Feet Per Second)
1	6 (Not reefed)	164
2	5	173
3	4	202
4	3-1/2	211
5	3	218
6	2-1/2	241
7	2	256
8	1-1/2	298

c. Detailed data are tabulated in Appendix (C).

Aircraft Drops of Reefed Parachutes,
Mk. 2 Mod. 3, Assembled on Mines, Mk. 36,
To Determine Terminal Velocity and Flight Characteristics

PART D

CONCLUSIONS

11. It was concluded that:

a. The flight characteristics of each mine were satisfactory.

b. The terminal velocity for each mine drop is as follows:

Drop No.	Diameter of Mouth of Chute (Feet)	Terminal Velocity (Feet Per Second)
1	6 (Not Reefed)	164
2	5	173
3	4	202
4	3-1/2	211
5	3	218
6	2-1/2	241
7	2	256
8	1-1/2	298

The estimated probable errors of the terminal velocities are plus or minus five feet per second.

PART E

DISPOSITION OF MATERIAL

12. The eight mines dropped were recovered and the parachutes were returned to the Naval Ordnance Laboratory representatives.

Aircraft Drops of Reefed Parachutes,
Mk. 2 Mod. 3, Assembled on Mines, Mk. 36,
To Determine Terminal Velocity and Flight Characteristics

PREPARED BY: _____
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Commander, Naval Proving Ground,
Acting.

NP9 38657 - Parachute, Mk. 2 Mod. 3, reefed to a diameter of 3 feet.
3 May 1949
RESTRICTED

Figure 1

A

NP9 38269 - Reefed parachute, housed in Parachute Pack, Mk. 9 Mod. 0 (Modified), assembled on Mine, Mk. 36.
28 April 1949

RESTRICTED

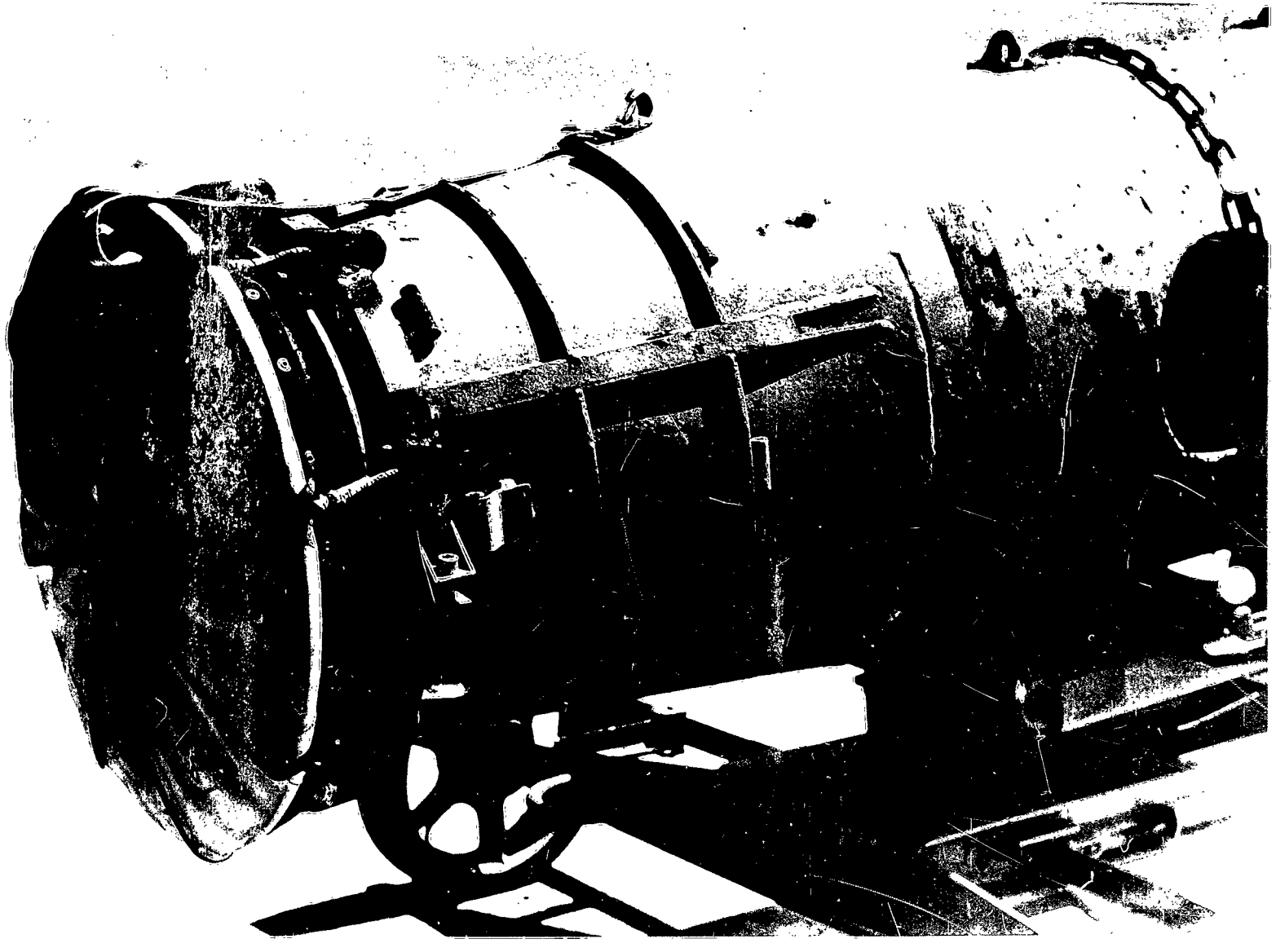

Figure 2

Aircraft Drops of Reefed Parachutes, Mk. 2 Mod. 3, Assembled on Mines, Mk. 36, To Determine Terminal Velocity and Flight Characteristics

NPG MOVIE NO. 808

(ORIGINAL ONLY, DELIVERED BY HAND TO THE NAVAL ORDNANCE LABORATORY, FIELD EVALUATION DIVISION)

TABLE I

TABULATED TEST DATA

Tests of Reefed Parachutes, Mk. 2 Mod. 3 assembled on Mines, Mk. 36.

Date	Plane Type	Weight of Unit	Airspeed at Release (Knots, Ind.)	Altitude at Release (feet true)	Diameter of Chute (Feet)	Vertical Component of Striking Vel. (f/s)	Ballistic* Coefficient	Terminal* Velocity	Remarks
4/28/49	TBM-3E	1056	120	5000	6	163	.0415	164	Chute not reefed. Slight oscillation. Good flight.
"	"	1080	"	"	5	173	.0460	173	Oscillated during descent. Satisfactory flight.
"	"	1063	"	"	4	202	.0620	202	Oscillated slightly. Satisfactory flight.
"	"	1076	"	"	3.5	210	.0665	211	Satisfactory flight.
"	"	1067	"	"	3	219	.0715	218	Satisfactory flight.
4/29/49	"	1079	"	"	2.5	239	.0860	241	Satisfactory flight.
"	"	1051	"	"	2	254	.0965	256	Slight oscillation. Good flight.
"	"	1066	"	"	1.5	292	.128	298	Satisfactory flight.

* Values adjusted to standard air density.

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APPENDIX C

Aircraft Drops of Reefed Parachutes,
Mk. 2 Mod. 3, Assembled on Mines, Mk. 36,
To Determine Terminal Velocity and Flight Characteristics

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Aircraft Drops of Reefed Parachutes,
Mk. 2 Mod. 3, Assembled on Mines, Mk. 36,
To Determine Terminal Velocity and Flight Characteristics

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U

U.S. Naval Proving Ground, Dahlgren, Va. (355)
SEVENTH PARTIAL REPORT ON MINE AND MINE COMPONENTS TESTING UNDER TASK ASSIGNMENT NPG-33-RE6B-311-1 - FINAL REPORT ON AIRCRAFT DROPS OF REEFED PARACHUTES, MK.2 MOD. 3, ASSEMBLED ON MINES, MK.36, TO DETERMINE TERMINAL VELOCITY AND FLIGHT CHARACTERISTICS - AND APPENDIXES A-D (NPG REPORT), by E.B. Hall. Aug '49, 7 pp. incl. photos, tables.

[redacted]

(Not abstracted)

I. Mines, Parachute
I. Hall, E.B.

(OVER)

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